

A Finely Crafted O'Brien Unit 2 Test

Technology Aided Section: You may use a calculator or applications on your laptop- **no internet or notes**. Use a pencil. Show all work and circle your answer. Use your time wisely: you will be able to earn additional credit after the timed portion of the test by completing Supercorrections. When you finish, you can come up to get the non-technology part—you may continue to work on both sections without the aid of technology.

1. Simplify each expression. Assume that no variable equals zero.

a. $y^3(x^2y)$

$$x^2y^4$$

b. $(9rt)^2(3rst)^{-3}$

$$81r^2t^2 \cdot \frac{1}{27} r^{-3}s^{-3}t^{-3}$$

$$= 3r^{-1}s^{-3}t^{-1} = \frac{3}{rs^3t}$$

c. $\frac{14r^2s^{-3}t^4}{35r^{-2}s^5t^3}$

$$\frac{2r^4t}{5s^8}$$

d. $\left(\frac{3p^4q^{-1}}{8p^{-2}q^3}\right)^{-2} = \frac{64p^{-8}q^2}{9p^4q^{-6}}$

$$= \frac{64q^8}{9p^{12}}$$

2. Give an example of a number that is:

(If there is no example, write NONE.)

a. rational but not an integer

$$\frac{2}{3} \quad 0.6 \text{ etc.}$$

b. real but not rational

$$\pi \text{ etc.}$$

c. a natural number but not a whole number

None

d. an integer but not a natural number

$$0, -3 \text{ etc.}$$

3. The cost of enrolment at a community college is \$120 plus \$75 per credit, c , taken. Express the college costs as a function of c and find the cost when 12 credits are taken.

$$\text{College cost} = 120 + 75c$$

$$\$1020$$

4. Consider $f(x) = 5x^2 - 4x + 7$. Evaluate.

a. $f(-2)$

35

b. $f(0)$

7

c. $f(2)$

19

5. Evaluate.

a. $\lceil -2.7 \rceil = -3$

b. $\lceil -2.7 \rceil = -2$

c. $\lfloor -2.7 \rfloor = 2.7$

d. $\lceil 2.3 \rceil + \lceil 4.7 \rceil - \lfloor -3 \rfloor$
 $2 + 5 - 3 = 4$

6. Let $f(x) = 2x + 7$ and $g(x) = x - 9$. Find:

a. $f + g$

$2x + 7 + x - 9$

$3x - 2$

b. $f \cdot g$

$(2x + 7)(x - 9)$
 $2x^2 - 11x - 63$

c. $(g \circ f)(3)$

$g(f(3))$
 $= g(13) = 4$

d. $(f \circ g)(2)$

$f(g(2))$
 $= f(-7) = -7$

7. Identify each transformation from the parent function f to g .

a. $f(x) = \sqrt{x}$, $g(x) = \sqrt{x} - 3$

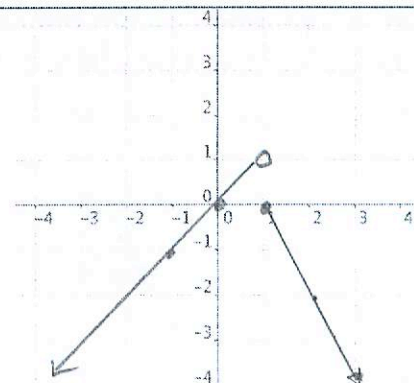
Translate down 3.

b. $f(x) = x^2$, $g(x) = (x + 3)^2 - 4$

Translate left 3 and down 4.

8. Graph the function.

$$f(x) = \begin{cases} x & \text{if } x < 1 \\ -2x + 2 & \text{if } x \geq 1 \end{cases}$$



9. Evaluate each expression.

a. $5 + 2(7 - 4)^2$

$5 + 2(3)^2$

$5 + 2(9)$

$5 + 18$

23

c. $\frac{4+6}{2} + 2 \cdot 5$

$\frac{10}{2} + 10$

$5 + 10$

15

b. $12 - 9 \div 3 + 2 \cdot 5$

$12 - 3 + 10$

$9 + 10$

19

d. $5 \cdot 4 \div 2 + 3^{(4-1)}$

$20 \div 2 + 3^3$

$10 + 27$

37

10. If p is an integer and q is an integer, must p^q be an integer? Explain.

No. If p is 3 and q is -2, then $3^{-2} = \frac{1}{9}$.

11. Find the inverse of the relation. State whether the relation is a function. State whether the inverse is a function.

$\{(5, 7), (7, 12), (9, 7), (11, 12), (13, 7)\}$

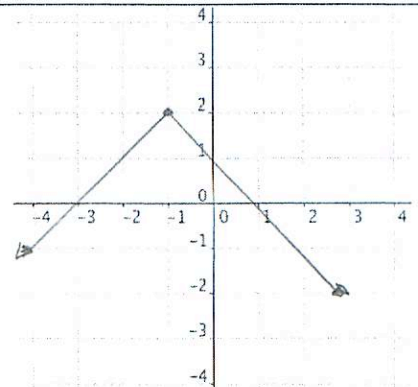
Function.

$\{(7, 5), (12, 7), (7, 9), (12, 11), (7, 13)\}$

Not a function.

12. Consider the function $f(x) = -|x+1| + 2$.a. Use transformations to sketch the graph of f .b. Give the domain and range of f .

Domain: all real numbers

Range: $f \leq 2$ 

13. Consider $f(x) = -5x + 7$ and $g(x) = -\frac{1}{5}x + \frac{7}{5}$.

a. Find $f \circ g$.

$$\begin{aligned} f(g(x)) &= f\left(-\frac{1}{5}x + \frac{7}{5}\right) \\ &= -5\left(-\frac{1}{5}x + \frac{7}{5}\right) + 7 \\ &= x - 7 + 7 \\ &= x \end{aligned}$$

b. Find $g \circ f$.

$$\begin{aligned} g(f(x)) &= g(-5x + 7) \\ &= -\frac{1}{5}(-5x + 7) + \frac{7}{5} \\ &= x - \frac{7}{5} + \frac{7}{5} \\ &= x \end{aligned}$$

c. How are f and g related?

Inverses!

14. Find an equation for the inverse.

$$f(x) = \frac{3x - 8}{4}$$

$$y = \frac{3x - 8}{4}$$

$$4y = 3x - 8$$

$$4y + 8 = 3x$$

$$\frac{4y + 8}{3} = x$$

$$f^{-1}(x) = \frac{4x + 8}{3}$$

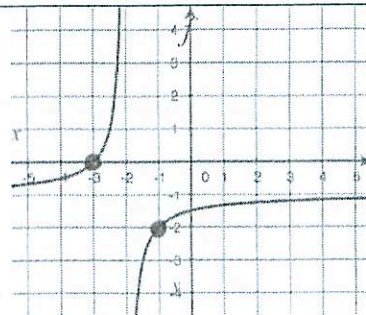
15. The graph of the function $f(x)$ is shown at right.

a. Find $f(-3)$.

0

b. Find $f^{-1}(-2)$.

-1



16. Miranda claims that $16^{\frac{1}{2}}$ and $8^{\frac{2}{3}}$ are the same number. Is she correct? Why or why not?

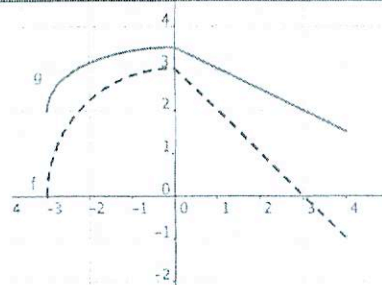
$$\sqrt{16} \quad (\sqrt[3]{8})^2$$

$$= 4 \quad = 2^2 = 4.$$

Yes! Both are 4.

Bonus: The dashed graph is the function $y = f(x)$ and the solid graph is the function $y = g(x)$. Rewrite $g(x)$ in terms of $f(x)$.

$$g(x) =$$



Go back and check your answers- the fewer Supercorrections, the better!